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ABSTRACT

Interactions between learning styles, gender, and life cycle stages of graduate students were investigated. Six learning styles were identified through use of the Grasha-Riechmann Student Learning Styles Scales: avoidant, collaborative, dependent, competitive, independent, and participant. Life cycle stages were based on Levinson's theory of the adult life cycle: entering the adult world (ages 22 to 28), age 30 transition (ages 28 to 33), settling down (ages 33 to 40), midlife transition (ages 40 to 45), and entering middle adulthood (ages 45-50). The sample consisted of 183 male and 322 female graduate students at the University of New Mexico, Albuquerque. Students were enrolled in 500 and 600 level classes and were between the ages of 22 and 50. The findings indicated that the graduate students used different learning styles. While no significant difference in learning styles was found for men and women, men were more avoidant and females were more participatory. No significant difference in learning style between the life cycle stages occurred; however, individuals tended to be more independent the greater their life cycle stages. In addition, individuals tended to be less avoidant and more participatory the greater their life cycle stage. Implications of the findings for graduate-level education are considered. (SW)

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LEARNING STYLES, GENDER AND LIFE CYCLE STAGE: RELATIONSHIPS WTH RESPECT TO GRADUATE STUDENTS

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Purpose of the Study

The purpose of this study was to determine if each of the six learning styles, as measured by the Grasha-Riechmann Student Learning Styles Scales (1979) was related to the gender and life cycle stages, as defined by Levinson (1978), of graduate students in a university setting. The following questions were addressed in the study. (1) Are there differences in learning styles between genders? (2) Are there differences within the genders with respect to learning styles? (3) Is there an interaction of learning style, gender and life cycle stage? (4) Are there group differences in learning styles among the life cycle stages? (5) Are there differences within each life cycle stage with respect to learning style? (6) Is there a relationship between certain learning styles and a particular gender? (7) Is there a relationship between certain learning styles and a particular life cycle stage?

Background

In this study the researcher investigated the learning styles of graduate students (adult learners) in a university setting and analyzed questions that related to the interactions of various learning styles, gender, and life cycle stages of those students.

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The study was based on the documentation of researchers that the learning styles of students are not taken into account by instructors because of the assumption that a given method will affect all students in the same way (Davis, 1977).

Procedures and Methodology

The research design that was utilized for this investigation was the survey method. This design was deemed appropriate because the study was a social-scientific investigation that involved a large population and a surey of a sample from that population to discover the relative incidence, distribution, and interrelations of the variables described above (Kerlinger, 1973). The instrument that was employed, The Grasha-Riechmann Student Learning Style Scales (GRSLSS), is reliable and valid for this population (Okun, Martens & Witter, 1982).

Relationships and differences among and within various groups were analyzed statistically by means of Multivariate Analysis of Variance using a Repeated Measure Design (Bock, 1963). Data collection took place at the University of New Mexico in Albuquerque, New Mexico, and all procedures protected the rights of the participants in accordance with the policies of the University's Human Research Committee.

The population for this study was graduate students enrolled at institutions of higher education within the United States of America. The sample for this study was taken from graduate students enrolled in 500 and 600 level graduate classes at the University of New Mexico, Albuquerque, New Mexico, that met on a regular basis. Also, those graduate students had to be within

the age range of twenty-two to fifty years of age. A total of 505 students were surveyed who met the criteria. In the sample, 183 subjects were males and 322 were females (Figure 1).

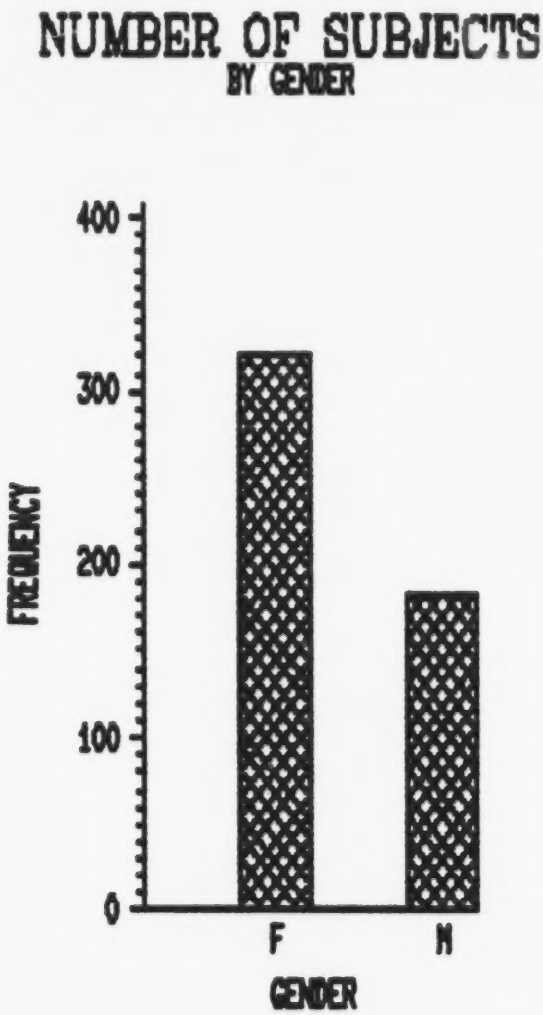

Figure 1: Number of Subjects by Gender.

The variable of life cycle stage was divided into five levels based on Levinson's theory (1978) of the adult life cycle. The five levels used in this study were as follows: (1) Entering the Adult World, ages 22 to 28, had 161 subjects, of which 68 were males and 93 were females. (2) Age 30 Transition, ages 28 to 33, had 102 subjects, of which 41 were males and 61 were females. (3) Settling Down, ages 33 to 40, had 153 subjects, of which 47 were males and 106 were females. (4) Midlife Transition, ages 40 to 45, had 54 subjects, of which 12 were males and 39 were females. (5) Entering Middle Adulthood, ages 45 to 50, which had 35 subjects, of which 12 were males and 23 were females. The age of all subjects were 32.3 years, with males averaging 32.7 years and females averaging 32.1 years (Figures 2, 3, 4).

A factor analysis was used to confirm the construct of the six scales of the GRSLSS. The original scales as defined by Grasha and Riechmann (1974) and the six factors (scales) that were defined from the factor analysis from this present study are basically the same. This acknowledgment demonstrates that the GRSLSS as designed by Grasha and Riechmann can be used in the study of graduate students and also confirms the findings of Okun, Martens, and Witter (1982) that the GRSLSS is valid for graduate students.

A Multivariate Repeated Measures Analysis (SPSSX, Inc., 1983) was performed with the six categories of the GRSLSS as the repeated factor and as the dependent variables. The independent variables in this analysis were gender (two levels) and life cycle stage (five levels). The full model of the design was tested,

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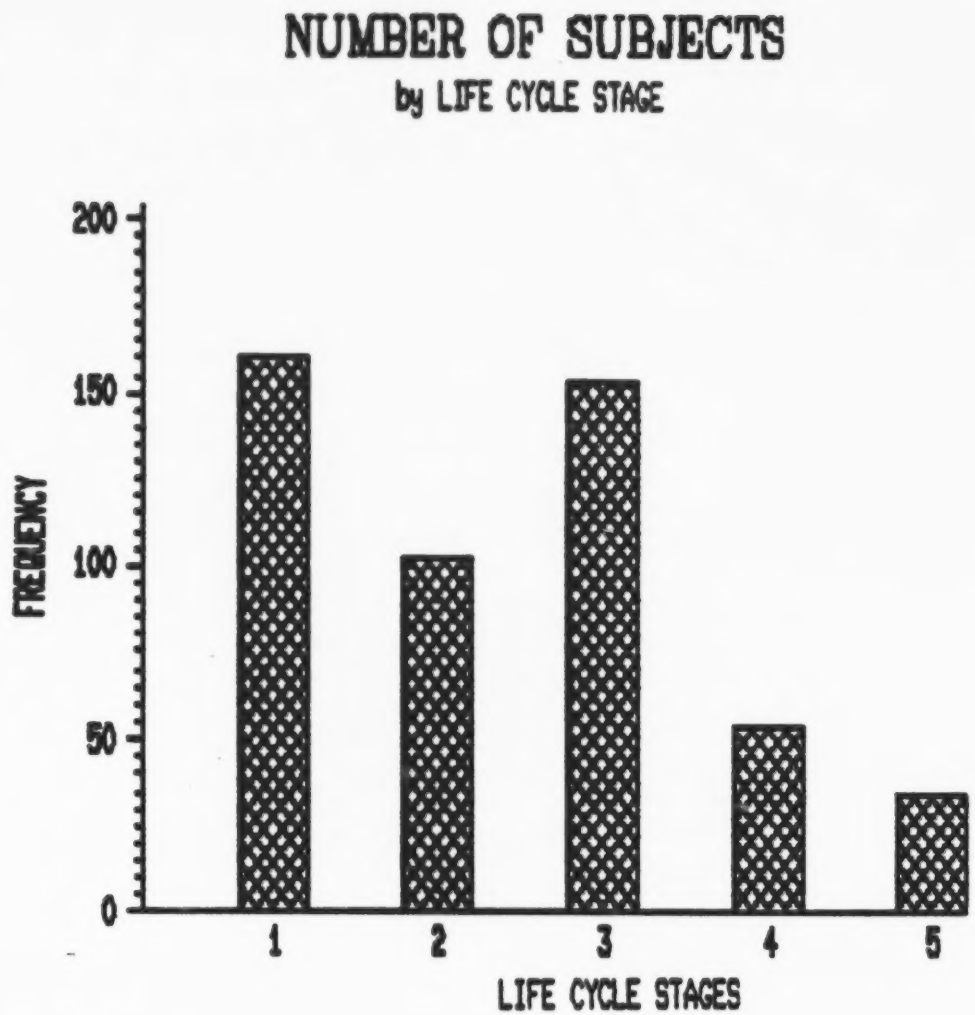

Figure 2: Number of Subjects by Life Cycle Stage.

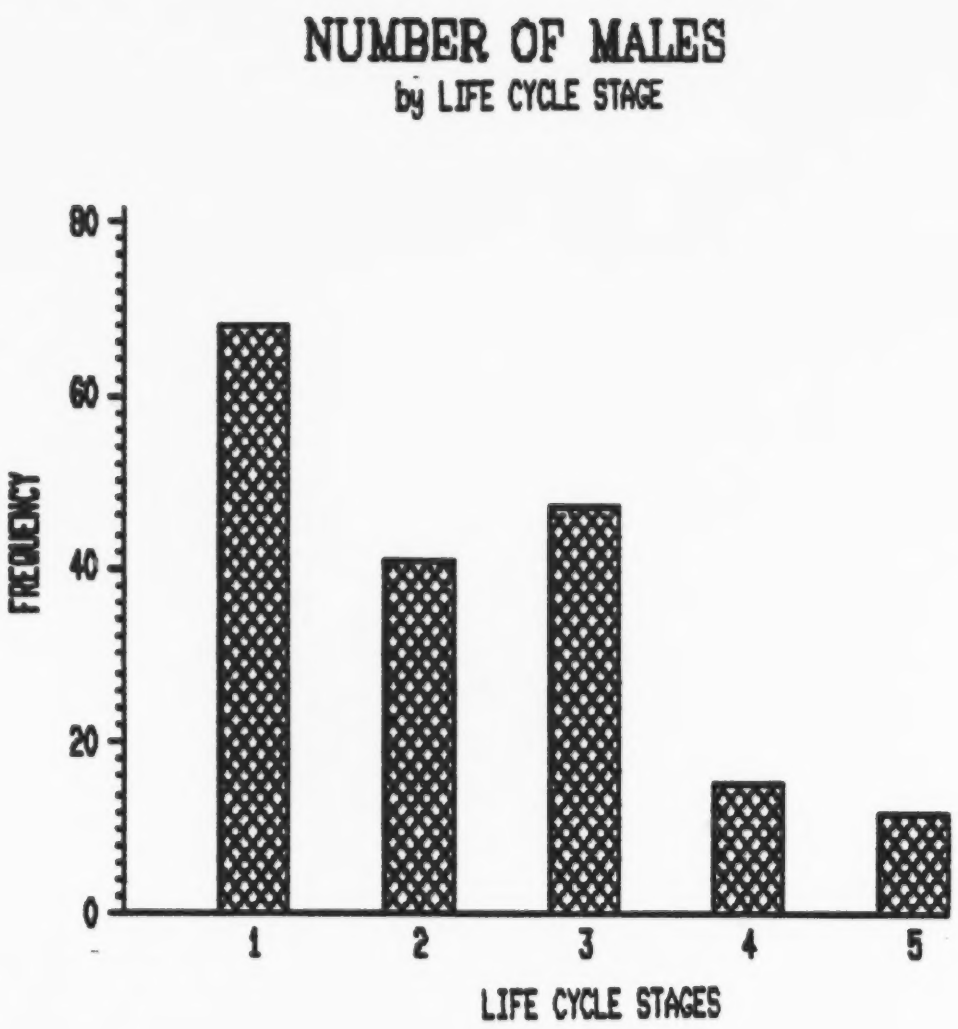

Figure 3: Number of Males by Life Cycle Stage.

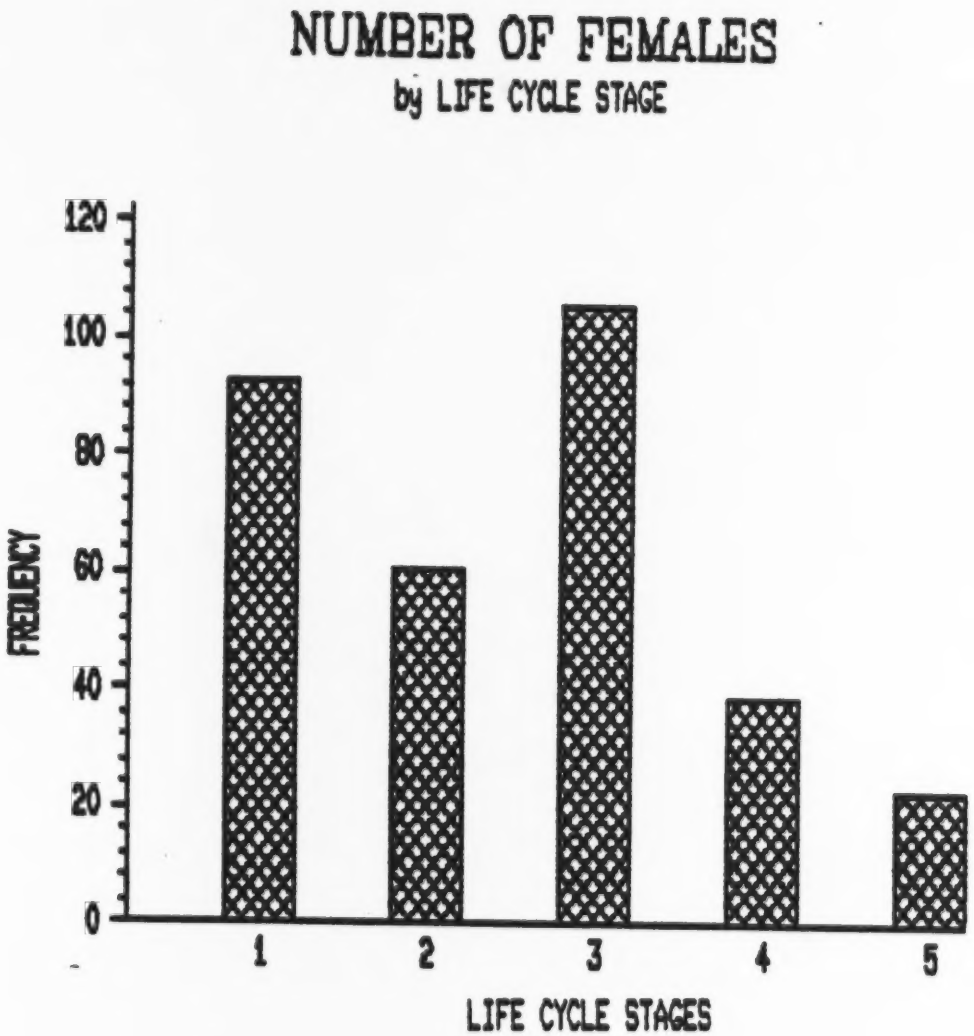

Figure 4: Number of Females by Life Cycle Stage.

and the within-subject error term was the overall error term for the full model. The classic experimental approach was used for this analysis because of the non-orthogonal nature (unequal numbes of subjects in the interaction cells) of this data. The classic solution tests each source of variance controlling for all others that are simpler as well as that same level of complexity. As a result, some overlap variance is thrown out. Traditionally this approach is used with unbalanced number of subjects and is the default solution used by SPSSX (1983). Simple effects tests and post hoc analysis, Scheffe tests, and Trend analysis were used.

Summary of the Results

A test of reliability using the SPSSX (SPSSX, Inc., 1983) reliability program was run, yielding the following results for the six scales of the GRSLSS: Independent, .64; Avoidant, .82; Collaborative, .81; Dependent, .68; Competitive, .74; Participant, .81. These coefficients exhibit acceptable reliability for the six scales of the GRSLSS.

A factor analysis was used to confirm the construct validity of the GRSLSS, of which six factors were defined that resembled the original factors (scales) as designed by Grasha and Riechmann (1979). The total amount of variance accounted for by the six factors was 32.3%. Additionally, a total of 64 of the 90 questions of the GRSLSS loaded on the six factors. The factor analysis confirmed the construct validity of the instrument for this population and the sample drawn from it (Table 1). Means

and standard deviation results are presented in Table 2, 3, and 4.

Table 1

Amount of Variance Accounted for per Factor

FACTORS	Percent of Variance	Cumulative Percentages
(1) Avoidant	11.6	11.6
(2) Collaborative	6.2	17.8
(3) Dependent	5.0	22.8
(4) Competitive	4.4	27.2
(5) Independent	2.7	29.8
(6) Participant	2.5	32.3

Examination of the results of the MANOVA (Between-Subjects) (Table 5), shows that no significant differences were found for the main effects of gender and life cycle stage on the six scales of the GRSLSS. The interaction of gender and life cycle stage was found not to be significant. Examination of the results of the MANOVA (Within-Subjects) (Table 6), revealed that the second-order interaction of gender, life cycle stage, and learning style on the six scales of the GRSLSS was not significant. However, analysis of the first order interaction of gender and learning style was significant ($F(5,2475) = 7.99$, $p<.05$, experiment-wise).

Analysis of simple effects tests showed that learning style scores were significantly different for each gender, and the analysis of Scheffe tests showed that there were significant differences for males between the learning style scores for all

Table 2

Means and Standard Deviations of

Learning Style Scale Scores by Gender

	Males		Females	
Scales	M	SD	M	SD
Independent	3.39	.42	3.38	.44
Avoidant	2.00	.61	1.79	.53
Collaborative	3.70	.62	3.73	.53
Dependent	3.39	.48	3.41	.44
Competitive	2.75	.53	2.64	.52
Participant	4.03	.54	4.21	.45

Table 3

Means and Standard Deviations of

Learning Style Scale Scores by Life Cycle Stage

	Life Cycle Stages									
	1		2		3		4		5	
Scale	M	SD	M	SD	M	SD	M	SD	M	SD
Ind	3.28	.40	3.41	.42	3.42	.43	3.47	.48	3.46	.47
Avoid	1.96	.60	1.99	.61	1.76	.51	1.74	.51	1.66	.43
Coll	3.72	.57	3.77	.56	3.69	.57	3.62	.56	3.78	.53
Dep	3.45	.48	3.37	.42	3.39	.48	3.42	.39	3.29	.55
Comp	2.68	.51	2.69	.50	2.70	.56	2.68	.50	2.60	.64
Part	4.03	.52	4.07	.52	4.21	.46	4.32	.42	4.35	.36

Table 4

Means and Standard Deviations of Learning Style Scale Scores by Life Cycle Stage for Males and Females

Female (F)
Male (M)

		Life Cycle Stages									
		1		2		3		4		5	
Scale		M	SD	M	SD	M	SD	M	SD	M	SD
Ind	(M)	3.29	.43	3.36	.33	3.47	.47	3.51	.39	3.58	.37
	(F)	3.27	.38	3.44	.47	3.40	.42	3.45	.51	3.40	.51
Avoid	(M)	2.03	.69	2.15	.56	1.94	.59	1.85	.42	1.79	.43
	(F)	1.92	.53	1.88	.63	1.69	.45	1.70	.54	1.63	.43
Coll	(M)	3.72	.56	3.78	.56	3.67	.72	3.50	.62	3.66	.73
	(F)	3.73	.57	3.77	.55	3.70	.49	3.66	.53	3.85	.40
Dep	(M)	3.40	.45	3.41	.40	3.38	.60	3.43	.34	3.23	.55
	(F)	3.49	.44	3.34	.44	3.39	.41	3.42	.40	3.33	.55
Comp	(M)	2.70	.50	2.82	.52	2.76	.64	2.70	.38	2.86	.52
	(F)	2.67	.52	2.60	.46	2.68	.51	2.67	.54	2.46	.66
Part	(M)	3.95	.58	3.94	.48	4.10	.58	4.16	.45	4.28	.35
	(F)	4.09	.46	4.15	.53	4.25	.39	4.38	.39	4.36	.37

comparisons except Independent to Dependent (Table 7). Analysis of Scheffe tests also showed that there were significant differences in learning style scores for females for all comparisons except Independent to Dependent (Table 8). Analysis of simple effects tests also showed asignificant difference between males and females on the Avoidant scale ($F(1,503) = 22.01$, $p<.05$, experiment-wise) and a significant difference between males and females on the Participant scale ($F(1,503) = 17.44$, $p<.05$, experiment-wise).

Table 5

MANOVA Summary Table

Between-Subject Factors

Source	Variance	Sums of Squares	df	Mean Square	F-ratio
Gender	<.01	.18	1	.18	< 1
Life Cycle Stage	<.01	.35	4	.09	< 1
Gender by LCS	<.01	.53	4	.13	< 1
Within Cells		110.86	495	.22	

* P < .05, experiment-wise

The following list of abbreviations was designed in order to interpret the MANOVA summary tables.

(G) = Gender

(LS) = Learning Style

(LCS) = Life Cycle Stage

(LCS 1) = Life Cycle Stage 1, Ages 22 to 28

(LCS 2) = Life Cycle Stage 2, Ages 28 to 33

(LCS 3) = Life Cycle Stage 3, Ages 33 to 40

(LCS 4) = Life Cycle Stage 4, Ages 40 to 45

(LCS 5) = Life Cycle Stage 5, Ages 45 to 50

(Ind) = Independent (Comp) = Competitive

(Avoid) = Avoidant (Part) = Participant

(Coll) = Collaborative (Dep) = Dependent

Table 6

MANOVA Summary Table

Within-Subject Factors

Source	Variance	Sums of Squares	df	Mean Square	F-ratio	
Learning Style	.89	1658.29	5	331.66	1282.95	*
Gender by LS	.05	10.33	5	2.07	7.99	*
LS at Male			5		198.30	*
LS at Female			5		640.81	*
G at Ind		.02	1	.02	< 1	
G at Avoid		5.13	1	5.13	22.90	*
G at Coll		.08	1	.08	< 1	
G at Dep		.07	1	.07	< 1	
G at Com		1.30	1	1.30	5.81	
G at Part		3.91	1	3.91	17.44	*
LCS by LS	.08	15.77	20	.79	3.05	*
LCS at Ind		2.59	4	.65	2.89	*
LCS at Avoid		6.92	4	1.73	7.72	*
LCS at Coll		1.11	4	.28	1.24	
LCS at Dep		.91	4	.23	1.10	
LCS at Com		.33	4	.08	< 1	
LCS at Part		6.13	4	1.53	6.85	*
LS at LCS 1			5		197.66	*
LS at LCS 2			5		122.49	*
LS at LCS 3			5		332.68	*
LS at LCS 4			5		110.25	*
LS at LCS 5			5		106.34	*
G by LCS by LS	.01	3.03	20	.15	.59	
Within Cells		639.82	2475	.25		

* p < .05, experiment-wise

Table 7

Scheffe Summary Table

Post Hoc Analysis of LS at Male

Scale	M	SD
Ind	3.39	.42
Avoid	2.00	.61
Coll	3.70	.62
Dep	3.39	.48
Comp	2.75	.53
Part	4.03	.54

Source	df	F'
LS at Male		
Part to Avoid	1,181	1460.73 *
Part to Comp	1,181	578.09 *
Part to Dep	1,181	145.47 *
Part to Ind	1,181	144.03 *
Part to Coll	1,181	38.03 *
Coll to Avoid	1,181	1027.35 *
Coll to Comp	1,181	149.50 *
Coll to Dep	1,181	34.74 *
Coll to Ind	1,181	34.03 *
Ind to Avoid	1,181	687.11 *
Ind to Comp	1,181	145.02 *
Ind to Dep	1,181	< 1
Dep to Avoid	1,181	684.25 *
Dep to Comp	1,181	143.57 *
Comp to Avoid	1,181	200.96 *

p <.05 experiment-wise , F critical = 11.95

Table 8

Scheffe Summary Table

Post Hoc Analysis of LS at Female

Scale	M	SD
Ind	3.38	.44
Avoid	1.79	.53
Coll	3.73	.53
Dep	3.41	.44
Comp	2.64	.52
Part	4.21	.45

Source	df	F'
LS at Female		
Part to Avoid	1,320	3666.90 *
Part to Comp	1,320	1531.50 *
Part to Ind	1,320	434.20 *
Part to Dep	1,320	399.40 *
Part to Coll	1,320	146.41 *
Coll to Avoid	1,320	2347.88 *
Coll to Comp	1,320	730.89 *
Coll to Ind	1,320	76.34 *
Coll to Dep	1,320	62.17 *
Dep to Avoid	1,320	1645.92 *
Dep to Comp	1,320	366.72 *
Dep to Ind	1,320	< 1
Ind to Avoid	1,320	1577.48 *
Ind to Comp	1,320	344.80 *
Comp to Avoid	1,320	458.82 *

p <.05, experiment-wise, F critical = 11.95

An examination of the MANOVA results for the first order interaction of life cycle stage and learning style was significant ($F(20,2475) = 3.05$, $p<.05$, experiment-wise). Analysis of simple effects tests revealed that life cycle stage was significantly related to learning style for the Independent scale, and analysis of Scheffe tests showed no significance due to the conservative nature of the Scheffe test in control of Type I errors. Life cycle stage was significantly related to learning style for the Avoidant scale, and analysis of Scheffe tests showed significant differences for the following comparisons: LCS 1 to LCS 5, LCS 1 to LCS 3, LCS 2 to LCS 4, LCS 2 to LCS 5, and LCS 2 to LCS 3. Life cycle stage was significantly related to learning style on the Participant scale for the following comparisons: LCS 3 to LCS 1, LCS 4 to LCS 1, LCS 5 to LCS 1, and LCS 4 to LCS 2 (Table 9).

Analysis of simple effects tests showed a significant relationship between learning style and life cycle stage 1 ($F(5,2475) = 197.66$, $p<.05$, experiment-wise), and examination of Scheffe tests showed significant differences for all possible comparisons except Independent to Dependent, and Collaborative to Dependent (Table 10). Analysis of simple effects tests revealed a significant difference between learning style and life cycle stage 2 ($F(5,2475) = 122.49$, $p<.05$, experiment-wise), and Scheffe tests revealed significant differences for all comparisons except Independent to Dependent (Table 11). Analysis of simple effects tests showed a significant relationship between learning style and life cycle stage 3 ($F(5,2475) = 332.68$, $p<.05$, experiment-wise), and Scheffe tests showed significant differences for all

Table 9

Scheffe Summary Table Post Hoc Analysis of LCS at Ind, LCS at Avoid, and LCS at Part

Ind			Avoid			Part		
LCS	M	SD	LCS	M	SD	LCS	M	SD
LCS 1	3.28	.40	LCS 1	1.96	.60	LCS 1	4.03	.52
LCS 2	3.41	.42	LCS 2	1.99	.61	LCS 2	4.07	.52
LCS 3	3.42	.43	LCS 3	1.76	.51	LCS 3	4.21	.46
LCS 4	3.47	.48	LCS 4	1.74	.51	LCS 4	4.32	.42
			LCS 5	1.66	.43	LCS 5	4.35	.36

Source	Comparisons	df	F'	
LCS at Ind	LCS 4 to LCS 1	4,500	<1	
	LCS 3 to LCS 1	4,500	7.08	
	LCS 2 to LCS 1	4,500	4.86	
LCS at Avoid	LCS 5 to LCS 1	4,500	11.68	*
	LCS 4 to LCS 1	4,500	9.01	
	LCS 3 to LCS 1	4,500	13.91	*
	LCS 5 to LCS 2	4,500	12.33	*
	LCS 4 to LCS 2	4,500	9.63	*
	LCS 3 to LCS 2	4,500	13.57	*
LCS at Part	LCS 3 to LCS 1	4,500	10.84	*
	LCS 4 to LCS 1	4,500	14.72	*
	LCS 5 to LCS 1	4,500	11.76	*
	LCS 3 to LCS 2	4,500	5.40	
	LCS 4 to LCS 2	4,500	10.00	*
	LCS 5 to LCS 2	4,500	8.43	

* $p < .05$, experiment-wise, F critical = 9.36

Table 10

Scheffe Summary Table

Post Hoc Analysis of LS at LCS 1

Scale	M	SD
Ind	3.28	.40
Avoid	1.96	.60
Coll	3.72	.57
Dep	3.45	.48
Comp	2.68	.51
Part	4.03	.52

Source	df	F'
LCS at LCS 1		
Part to Avoid	5,499	1337.09 *
Part to Comp	5,499	573.13 *
Part to Ind	5,499	177.14 *
Part to Dep	5,499	106.54 *
Part to Coll	5,499	29.97 *
Coll to Avoid	5,499	966.68 *
Coll to Comp	5,499	341.00 *
Coll to Ind	5,499	61.38 *
Coll to Dep	5,499	2.34
Dep to Avoid	5,499	688.75 *
Dep to Comp	5,499	190.32 *
Dep to Ind	5,499	8.93
Ind to Avoid	5,499	540.87 *
Ind to Comp	5,499	116.81 *
Comp to Avoid	5,499	154.93 *

* p <.05, experiment-wise, F critical = 11.95

Table 11

Scheffe Summary Table

Post Hoc Analysis of LS at LCS 2

Scale	M	SD
Ind	3.41	.42
Avoid	1.99	.41
Coll	3.77	.56
Dep	3.37	.42
Comp	2.69	.50
Part	4.07	.52

Source	df	F'
LS at LCS 2		
Part to Avoid	5,499	847.00 *
Part to Comp	5,499	372.92 *
Part to Dep	5,499	95.72 *
Part to Ind	5,499	83.99 *
Part to Coll	5,499	16.84 *
Coll to Avoid	5,499	624.88 *
Coll to Comp	5,499	231.20 *
Coll to Dep	5,499	32.24 *
Coll to Ind	5,499	25.60 *
Ind to Avoid	5,499	397.54 *
Ind to Comp	5,499	102.95 *
Ind to Dep	5,499	< 1
Dep to Avoid	5,499	372.29 *
Dep to Comp	5,499	90.77 *
Comp to Avoid	5,499	95.89 *

* p <.05, experiment-wise, F critical = 11.95

comparisons except Independent to Dependent (Table 12). Analysis of simple effects tests showed a significant relationship between learning style and life cycle stage 4 ($F(5,2475) = 110.25$, $p<.05$, experiment-wise), and examination of Scheffe tests showed significant differences for all comparisons except Collaborative to Dependent, Collaborative to Independent, and Independent to Dependent (Table 13). Analysis of simple effects tests showed a significant relationship between learning style and life cycle stage 5 ($F(5,2475) = 106.34$, $p<.05$, experiment-wise), and analysis of Scheffe tests revealed significant differences between all comparisons except Collaborative to Independent and Independent to Dependent (Table 14).

Examination of the MANOVA results also showed the main effect of the repeated measure of learning style was significant ($F(5,2475) = 1282.95$, $p<.05$, experiment-wise). Interpretation of this main effect revealed that there were significant differences in learning style scores for the six scales, and the above-mentioned comparisons confirm this interpretation.

A post hoc trend analysis yielded a significant linear trend for life cycle stage on the learning style of Avoidant. The significant negative linear relationship shared 18% of the variance. So as life cycle stage increased (age category), the score on the Avoidant scale decreased. A post hoc trend analysis yielded a significant linear trend for life cycle stage on the learning style of Participant. The significant positive linear relationship shared 21% of the variance. So as life cycle stage increased (age category), the score on the Participant scale also increased. No other trends at any level for any other scales were found to be significant.

Table 12

Scheffe Summary Table

Post Hoc Analysis of LS at LCS 3

Scale	M	SD
Ind	3.42	.43
Avoid	1.76	.51
Coll	3.69	.57
Dep	3.39	.48
Comp	2.70	.56
Part	4.21	.46

Source	df	F'
LS at LCS 3		
Part to Avoid	5,499	1774.50 *
Part to Comp	5,499	671.52 *
Part to Dep	5,499	196.76 *
Part to Ind	5,499	184.29 *
Part to Coll	5,499	78.94 *
Coll to Avoid	5,499	1105.16 *
Coll to Comp	5,499	269.15 *
Coll to Dep	5,499	26.45 *
Coll to Ind	5,499	22.00 *
Ind to Avoid	5,499	815.08 *
Ind to Comp	5,499	152.23 *
Ind to Dep	5,499	< 1
Dep to Avoid	5,499	789.48 *
Dep to Comp	5,499	141.29 *
Comp to Avoid	5,499	262.81 *

* p <.05, experiment-wise, F critical = 11.95

Table 13

Scheffe Summary Table

Post Hoc Analysis of LS at LCS 4

Scale	M	SD
Ind	3.47	.48
Avoid	1.74	.51
Coll	3.62	.56
Dep	3.42	.39
Comp	2.68	.50
Part	4.32	.42

Source	df	F'
LS at LCS 4		
Part to Avoid	5,499	694.76 *
Part to Coll	5,499	51.45 *
Part to Ind	5,499	75.77 *
Part to Dep	5,499	84.28 *
Part to Comp	5,499	280.20 *
Coll to Avoid	5,499	368.10 *
Coll to Comp	5,499	91.52 *
Coll to Dep	5,499	4.03
Coll to Ind	5,499	2.35
Ind to Avoid	5,499	311.65 *
Ind to Comp	5,499	64.56 *
Ind to Dep	5,499	< 1
Dep to Avoid	5,499	295.08 *
Dep to Comp	5,499	57.14 *
Comp to Avoid	5,499	92.53 *

* p <.05, experiment-wise, F critical = 11.95

Table 14

Scheffe Summary Table

Post Hoc Analysis of LS at LCS 5

Scale	M	SD
Ind	3.46	.47
Avoid	1.66	.43
Coll	3.78	.53
Dep	3.29	.55
Comp	2.60	.64
Part	4.35	.36

Source	df	F'
LS at LCS 5		
Part to Avoid	5,499	482.73 *
Part to Comp	5,499	203.84 *
Part to Dep	5,499	73.21 *
Part to Ind	5,499	51.92 *
Part to Coll	5,499	20.70 *
Coll to Avoid	5,499	303.50 *
Coll to Comp	5,499	94.62 *
Coll to Dep	5,499	16.05 *
Coll to Ind	5,499	7.05
Ind to Avoid	5,499	218.01 *
Ind to Comp	5,499	50.01 *
Ind to Dep	5,499	1.82
Dep to Avoid	5,499	179.96 *
Dep to Comp	5,499	32.73 *
Comp to Avoid	5,499	59.16 *

* P <.05, experiment-wise, F critical = 11.95

Findings Related to the Hypotheses

Hypothesis 1: There is a significant difference between genders with respect to learning style. No significant difference was found in the test of hypothesis 1.

Hypothesis 2: There is a significant difference in learning style between the life cycle stages. No significant difference was found in the test of hypothesis 2.

Hypothesis 3: There is a significant difference between the six learning styles for all subjects. A significant main effect of the repeated measure of learning style was found to be significant. Interpretation of this main effect revealed that there were significant differences in learning style scale scores for the six scales.

Hypothesis 4: There is a significant interaction between gender and life cycle stage. No significant difference was found in the test of this first order interaction.

Hypothesis 5: There is a significant interaction between learning style and gender. This interaction was found to be significant. Interpretation of this first order interaction revealed there were significant differences in learning styles per gender for all comparisons except the comparison of Independent to Dependent. Additionally, there was a significant difference for Avoidant and Participant scores. Males were more avoidant than females, and females were more participatory than males.

Hypothesis 6: There is a significant interaction between learning style and life cycle stage. This interaction was found to be significant. Interpretation of this first order interaction revealed that there were significant differences in learning style per life cycle stage and life cycle stage per learning style. The greater the life cycle stage (older the subject), the more an individual tended to score higher on the Independent scale. The greater the life cycle stage, the less avoidant an individual viewed himself/herself. The greater the life cycle stage, the more participatory an individual tended to be. There were no significant differences in mean scores for the comparisons of the Independent to Dependent scales for all five life cycle stages. There is no difference in the Independent and Dependent scale scores. Analysis of life cycle stage 1 revealed the comparison of the Collaborative to Dependent scales as not significant. Analysis of life cycle stage 4 revealed the comparison of Collaborative to Dependent and Collaborative to Independent as not significant. Analysis of life cycle stage 5 revealed the comparison of Collaborative to Independent as not being significant. This shows that there are no significant differences between these scale scores for the three life cycle stages.

Hypothesis 7: There is a significant relationship between learning style, gender, and life cycle stage. No significant difference was found in the test hypothesis 7.

Discussion and Conclusions

Instrumentation

The Grasha-Riechmann Student Learning Style Scales or GRSLSS (Grasha, 1972; Riechmann and Grasha, 1979) is a 90-item questionnare which asks students to express degrees off agreement by means of a modified Likert Scale on various self-descriptive items. The instrument is scored by summing the numerical ratings for 15 items making up each of the six scales. The scales are numerically independent in that it is possible to obtain high scores on all, none, or some.

The instrument covers attitudes toward learning, views of teachers and peers, and reactions to classroom procedures (Riechmann, 1972, 1974, 1981). Using information obtained from undergraduates, Riechmann and Grasha (1974) have determined that the instrument provides some evidence of its construct validity and that it has relatively high reliability. Factor analysis of the data by Andrews (1981) supported the divisions of the GRSLSS into six scales.

Development of this instrument was based on the six styles identified by Grasha (1972). A "rational approach" was used to develop the items (Riechmann and Grasha, 1974). One set of students generated possible items on the basis of the style descriptions, while another set of students sorted a refined pool of these items into the categories where they thought the items best fit. Items sorted into a given category with at least 70 percent consistency were used in the original version of the instrument, and this initial form was shortened into the present form using

inter-item correlations and reliability data which have been collected on the instrument.

Andrews (1981) studied undergraduate students at San Diego State University, and confirmed the quality of the scales by using factor analysis. Additionally, Okun, Martens, and Witter (1982) have indicated that the instrument has adequate validity and reliability for graduate students after studying graduates at Arizona State University (Okun, Martens, & Witter, 1982) found that the reliability of the instrument was relatively high. Okun found that the type of learning style had a statistically significant effect on the scale score. He concluded that the GRSLSS was useful to instructors of graduate students, and that it might be useful for future studies in graduate education.

This present study of graduate students at the University of New Mexico, Albuquerque, New Mexico, found similar results to the past studies of Grasha (1972); Riechmann (1972, 1974); Andrews (1981), Okun, Martens and Witter (1982); Swartz (1976); and Jason (1982). The reliability of the GRSLSS was found to be adequate, and the construct validity of the six scales was confirmed by factor analysis. Examination of results revealed no significant differences between groups for the variables of gender and life cycle stage (age category), which confirms past studies. However, within group differences were statistically significant, and there were statistically significant linear trends interpreted for two of the scales across the five life cycle stages of Levinson (1978) that were utilized.

As acknowledged by past researchers who have used the GRSLSS, there are positive outcomes for both faculty and students

after the administration and explanation of the results (Grasha and Riechmann, 1982). Students gain from the knowledge of their learning styles so that they can assess their own abilities. Also, instructors have a better awareness of the abilities of their students based on the types of learning styles the bring into the classroom. The GRSLSS needs to be used more extensively at the graduate level within the United States. The GRSLSS has an identity problem in higher education. Most faculty members do not know of its existence. Also, the instrument needs to be shortened to occupy less time in its administration.

Conclusions Related to Hypotheses

Hypothesis 1. The position that there is a difference between genders with respect to learning styles was found not to be significant. This finding supports the findings of Jason (1982) except for the Participant scale where Jason found a significant difference. Interpretation of this result suggests that instructors should not differentiate between genders when planning learning situations, because of the similarity of learning styles expressed by the two groups.

Hypothesis 2. The position that there is a difference in learning style between the life cycle stages was found not to be significant. This finding is of consequence since the examination of life cycle stages with respect to learning styles had not been examined previously. With respect to intepretation of this result, an instructor at the graduate level would not need to

group learning situations due to the similarity of learning styles between the life cycle stages.

Hypothesis 3. There was a significant difference between the six learning styles for all subjects. This finding supports the findings of Jason (1982), and Okun, Martens, and Witter (1982) who found overall differences in learning style scores for their subjects. Interpretation of this result shows an instructor at the graduate level that there are unique individual differences that need to be accommodated per particular student regardless of gender or life cycle stage. Designing learning situations by individual learning styles will be a greater task than blanket planning of learning situations, which would not dictate as much time to organize, conduct and evaluate.

Hypotheis 4. There was no significant interaction between gender and life cycle stage with respect to learning style. This finding is of consequence because the examination of the interaction of gender and life cycle stage with respect to learning style was not examined previously. With respect to interpretation of this result, an instructor of graduate level classes need not be concerned with the interaction of these two variables with respect to learning style when planning learning situations.

Hypothesis 5. There was a significant interaction between learning style and gender. This supports the findings of Kraft (1976) and Swartz (1976), who stated that women were more participatory. Examination of the results of this first order

interaction revealed that males were more avoidant than females, and females were more participatory than males. Also, there were significant differences found for all possible scale comparisons except Independent to Dependent. With respect to this interpretation of these results, an instructor of graduate level classes should construct learning situations so that they are participatory and for those individuals who assessed themselves as Avoidant, appropriate accommodations for that type of learning style should be made. Interpretation of the Independent and Dependent scores should be ignored when planning learning situations per gender.

Hypothesis 6. There was a significant interaction between learning style and life cycle stage. This finding is of consequence because examination of this interaction was not previously done. Interpretation of this result revealed that individuals tended to be more independent the greater their life cycle stage. Also, individuals tended to be less avoidant and more participatory the greater their life cycle stage. Further examination revealed there were no significant differences in mean score comparisons for the comparison of the Independent to Dependent scales for all five life cycle stages. Analysis of life cycle stage 1 revealed no significant difference for the comparison of the Collaborative to Dependent scales. Lastly, analysis of life cycle 4 revealed no significant difference for the comparison of the scales Collaborative to Dependent and Collaborative to Independent, and analysis of life cycle 5 revealed no significant difference for the comparison of the scales Collaborative to

Independent. With respect to interpretation of these results, an instructor at the graduate level should construct learning situations so as to accommodate the styles. Specifically, the instructor should ignore the results of the Independent and Dependent scales because statistically there is no difference between them per life cycle stage. In this situation the instructor should gear the learning situations to a participatory structure based on the life cycle stages that are represented in his classroom. If there is representation of life cycle stage 1, life cycle stage 4 or life cycle stage 5 in the class, the instructor should also be aware of the lack of statistical difference in the mean scores for the comparisons of Collaborative to Independent and Collaborative to Dependent.

Hypothesis 7. There was no significant difference found in the second order interaction of learning style, gender, and life cycle stage. The results of this finding are of consequence because examination of this interaction was not previously done. Examination of this result with respect to graduate level classes shows that instructors should not try to complex the planning of learning situations for their classes based on the combinations of many variables that might be exhibited by the members of those classes. This over examination of student uniqueness, if done, might lead to a clouding of the true learning situations that are necessary when planning at the graduate level.

Implication and Recommendation Introduction

According to Grasha and Riechmann (1979), if we are to help students be confident and effective learners, then we need to

give them the attention that is necessary concerning their individual learning styles. Students gain from the knowledge of their learning styles and tend to become more comfortable learners. The GRSLSS provides the framework to accomplish the above-mentioned items. Jason (1982) addressed the advantages of knowing the learning styles of graduate students and some of the advantages to instructors when planning strategies for classroom use. Specifically, he discussed the time saving that an instructor would gain by having the knowledge of student learning styles, and being able to use specific strategies within a classroom that complimented the individual styles of the students present. Okun, Martens and Witter (1982) saw the GRSLSS as a valuable tool in the relationship of the teaching/learning process in graduate education.

At this point in the discussion, a number of implications and recommendations are necessary. The following sections will address implications for learning situations of graduate students, recommendations to practitioners, and recommendations for further study in the area of learning styles, gender, and life cycle stages with respect to graduate students in the United States.

Implications

Instruction is one of the many duties of college professors. All faculty must divide their time among teaching, research, publication, counseling, serving on committees, service to the community, keeping abreast of their discipline, and countless other activities. Almost all professors find the necessary time

to accomplish all of these items. Currently, the duty that is paramount in the eyes of the Association of American Colleges (1985) is teaching and the ability to teach at the college/university level. Individual faculty members who are caught up by the desire to become excellent teachers and to be recognized by students and colleagues have little problem keeping abreast of how to accomplish their goals. However, some faculty members do not share the enthusiasm of their colleagues. They tend to instruct the way they have always done with disregard for current research findings concerning instruction, student profiles, and specifically student learning styles.

Knowledge of student learning styles will help the faculty member save time in trying to decide which learning situations to use in the graduate level classrooms. For example, a list of learning situations for each particular learning style could be assembled prior to the initial class meeting. Next, the administration of the GRSLSS would take place in order the determine the learning styles of the graduate students in attendance that session. Finally, the faculty member would then assess the make up of learning styles as determined by the GRSLSS, life cycle stage, and only then plan the appropriate learning situations for the class.

The findings of this study imply that female graduate students are more participatory the greater their life cycle stage. Males were more avoidant than females the younger they were. So the learning situations that a faculty member utilizes should be those which employ participation in order that the graduate student has an opportunity to interact within the

classroom. This is quite different from the lecture which is the common type of learning situation that is presented in graduate level classes. Even in graduate level seminar classes the faculty members should be a facilitator and not a lecturer. Examination of the findings also showed that there are no significant differences for the comparisons of the Independent to Dependent scales per life cycle stages. This implies a problem with the interpretation of the results from these two scales when trying to plan learning situations. A faculty member should ignore these results when trying to plan for life cycle stage groups because the true style of the learner may be misunderstood.

Recommendations for Future Study

Further research is needed on the learning styles of graduate students in a university setting. The GRSLSS is a reliable and valid tool for the assessment of six learning styles of graduate students as defined by Grasha and Riechmann (1979). However, in this study the GRSLSS did not always allow for exact interpretation of the Independent and Dependent scales by gender or life cycle stage. Revision of those two scales needs to be accomplished to aid in interpretation of the full instrument. The length of the GRSLSS which has 90 items, generally takes an average of 25 to 30 minutes to describe and administer. It would be advantageous to shorten the length of the questionnaire in half in order to save classroom time so that the process of assessing students' learning styles could be expedited.

This study dealt with a representative cross section of graduate students at a typical graduate school in the United

States. Future studies should examine the results of graduate students who are from a specific racial group, lower economic status, specific ethnic backgrounds, and especially those students who are 50 years of age or older. This group of students is currently one of the fastest growing cohorts on campuses of higher education. The future of many schools will depend on the knowledge of the characteristics of these older-than-average graduate students so that planners can accommodate the unique situations these older students possess.

Additional research should address the relationship of scholarship to student learning style and programs of study to student learning style. Clarification of the relationships scholarship has to student learning style will aid planners in the design of curricula based on current cohort characteristics, rather than traditional planning or even worse the retention of archaic programs that serve little if any useful purpose to society.

Instructors at the graduate level should be held accountable for their teaching. This should take precedence over other duties that are the responsibilities of the positions. Longitudinal studies of the relationship of instructor-chosen learning situations and graduate student learning styles should be pursued in conjunction with academic achievement.

Further study should be accomplished with respect to the relationship of graduate students in particular disciplines and learning style. Student retention within a discipline needs to be specifically examined based on student learning style. So that the true reasons are known why students leave a particular

program, university planners need to adjust programs and make suggestions to faculty based on these findings. Another facet of this suggestion might entail an examination of the length of time it takes a student to complete a program of study based on learning styles. This examination should shed some light on the actual planning of courses, the times that they are offered, and the total duration of the experience to be had.

With a society that is increasing in its quest for knowledge at the graduate level, there is a need to know more about the pool of individuals who will attend these institutions that offer graduate study. Without this knowledge of the potential client or current client, institutions will not accomplish their goals of educating the society.

SUMMARY

Knowledge of the students that you interact with as an instructor is one of the major necessities for all teachers. This study has added to knowledge base of learning styles for graduate students at the university level. The implications to practitioners were made in order to help answer any questions those individuals might have concerning the choice of learning situations for graduate students based on their unique characteristics. This study also established the utility of the GRSLSS as a reliable and valid tool for graduate students in the United States.

This study answered and generated a number of questions regarding graduate students' learning styles, life cycle stages, and gender. Graduate education faculty and planners have an

obligation to their clients to use the information that this study generated and to pursue excellence in education so that the students and the society as a whole will be served best.

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